REMARKS

This amendment is in response to the Official Action mailed October 28, 2005.

In the present paper, Applicants have amended claims 26 and 42. Claims 20-46 are now presented for the Examiner's consideration in view of the following remarks.

The Application

The present invention provides an accurate technique and apparatus for finding a fault in an underground conveyance sheath that is causing a locating tone to leak to ground. The invention operates by measuring a voltage differential between a reference voltage and a voltage of a single probe body with one or more probes in proximity with the conveyance, in electrical contact with the underground conveyance through ground water or a conducting gel. In a region where the conveyance sheath is intact, the locating tone voltage does not affect the voltage differential. Where there is a fault in the sheath causing current leakage from an internal conductor, through the medium to the probe, that voltage differential changes. In that way, the fault is detected.

In exemplary claim 20 of the present application, for example, an apparatus is provided for locating an insulation fault on a cable including a conductor carrying a current. The cable is at least partially submerged in a liquid. The apparatus includes at least one voltage probe adapted to be positioned adjacent the cable and displaced along the cable whereby the liquid conducts at least a portion of the current between the probe and an insulation fault on the cable. The apparatus further includes a voltage comparator electrically connected to the at least one

voltage probe for detecting an insulation fault when the voltage probe is positioned adjacent the fault.

In amended claim 26, an apparatus is provided for locating an insulation fault on a cable including a conductor carrying a current. The apparatus comprises at least one voltage probe adapted to be positioned adjacent the cable to establish electrical continuity with the cable, and to be displaced along the cable. The apparatus also includes a voltage source for applying between approximately 80 and 100 volts to the conductor, and a voltage comparator electrically connected to the at least one voltage probe for detecting an insulation fault when the voltage probe is positioned adjacent the fault.

In amended claim 42, a method is provided for locating an insulation fault on a cable including a conductor carrying a current. The method includes the steps of applying a voltage source of between approximately 80 and 100 volts to the conductor, displacing a voltage probe along the cable while maintaining it adjacent the cable for probing voltages at single positions on the cable, and detecting an insulation fault at a position of the probe on the cable by monitoring a voltage at the probe.

The Examiner has rejected claims 20-25 under 35 U.S.C. § 102(b) as unpatentable over U.S. Patent No. 5,530,364 to Mashikian et al. (Mashikian); and has rejected claims 26-32, 38, 40 and 42-46 under 35 U.S.C. § 103(a) as unpatentable over Mashikian in view of the Applicants' admitted prior art.

Applicants note that no basis for rejection was presented in the Official Action for claims 33-37, 39 and 41.

Applicants respectfully submit the claims as amended are novel and non-obvious for the reasons stated below, and that all the claims of the present application are in condition for allowance.

The Mashikian Patent

The Mashikian patent teaches a method and apparatus for locating a fault in a buried power cable. The disclosed technique utilizes a pair of sensors that measure a magnetic field outside the power cable:

> The two sensors 30 and 32 are typically spaced six to twelve inches apart, and have the ability to convert the residual magnetic field outside the power line 10 to current or voltage pulses using the principle of electromagnetic induction. When the PD site 24 is between the sensors 30 and 32, the PD pulses travel in opposite directions away from the site 24. In this position, the sensors 30 and 32 are designed to induce voltage signals 44 and 46 of opposite polarity, respectively, as illustrated in FIG. 5a.

(Mashikian, col. 6, lines 1-9). The sensors of Mashikian are not placed in electrical continuity with the cable, but are instead insulated from the cable by an insulating layer 52 (col. 6, lines 56-60; FIG. 6). Mashikian does not measure a voltage between the cable and ground, but instead measures current or voltage induced in the sensors by a magnetic field around the cable.

Because Mashikian depends on the measurement of a magnetic field to locate a fault, Mashikian must use two sensors to take measurements on both sides of the fault to cancel the magnetic field created by the normal current flowing through the cable:

> It is important to note that, in the absence of any PD signal, the noise signals appearing at the terminals of the sensors 30 and 32

> are subtracted from each other in the differential amplifier 36 resulting in very effective noise cancellation. This effective noise cancellation is a direct result of the design of the apparatus of the present invention which utilizes two, instead of just one sensor

(Mashikian, col. 6, lines 26-32). Mashikian therefore teaches away from the use of a single sensor.

Anticipation Rejections

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." M.P.E.P. § 2131 (quoting *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987)).

The examiner has rejected independent **claim 20** as anticipated by Mashikian. Applicants respectfully traverse that rejection because Mashikian does not teach or suggest the following limitation:

> at least one voltage probe adapted to be positioned adjacent the cable and displaced along the cable whereby the liquid conducts at least a portion of the current between the probe and an insulation fault on the cable.

No current can be conducted from the cable conductor to the probe of Mashikian. Instead, as noted above, the probe of Mashikian is insulated from the cable by the insulating layer 52. Furthermore, the Mashikian sensor is not a voltage probe but is instead a magnetic field sensor. The Mashikian probe operates on a completely different principle from the probe of the present invention. While Mashikian measures an induced magnetic field, the probe of claim 20 directly measures a voltage from current leakage.

For at least the above reasons, Applicants submit that independent claim 20, as well as **claims 21-25** which depend from claim 20 and incorporate its limitations, are patentable over Mashikian.

Applicants further submit that **claim 24** is patentable for the additional reason that Mashikian does not disclose a voltage probe having a conductive surface facing the cable. Instead, as clearly shown in FIGS. 6 & 7, Mashikian discloses the use of an insulating layer 52 facing the cable 10.

Obviousness Rejections

To establish prima facie obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. M.P.E.P. § 2143.03 (citing In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974)). Applicants assert that the claims as presented are patentable over the cited reference because several limitations contained in the claims are not taught or suggested in the art of record.

Independent **claim 26** has been amended to require that the "at least one voltage probe [be] adapted to be positioned adjacent the cable to establish electrical continuity with the cable. No such continuity may be established with the probe of Mashikian because that probe is

insulated. For at least that reason, Applicants submit that claim 26, as well as dependent **claims 27-33**, are patentable.

Applicants further submit that **claim 33** is patentable for the additional reason that Mashikian does not disclose a voltage probe having a conductive surface facing the cable. Instead, as clearly shown in FIGS. 6 & 7, Mashikian discloses the use of an insulating layer 52 facing the cable 10.

Independent method **claim 34** requires the step of:

> positioning a voltage probe adjacent the cable, whereby the liquid conducts at least a portion of the current between the probe and an insulation fault on the cable.

As noted above, the probe of Mashikian cannot be positioned whereby current is conducted between the probe and an insulation fault on the cable, because the probe is insulated. For at least that reason, Applicants submit that claim 34, as well as dependent **claims 35-41**, are patentable

Claim 42 has been amended to require that the voltage probe be displaced along the cable while maintaining it adjacent the cable for probing voltages at single positions on the cable. In contrast, Mashikian teaches the use of a pair of sensors spaced apart, and teaches away from the use of a single probe (Mashikian, col. 6, lines 26-32). Because the present invention directly measures voltage resulting from current leakage at the cable fault, the spaced-apart magnetic field sensors of Mashikian are unnecessary.

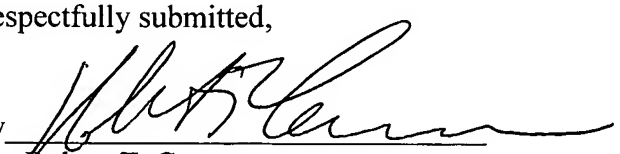
Because claim 42 now requires probing at a single position on the cable, Applicants submit that that claim is patentable over the combination made by the Examiner, and that claims dependent **claims 43-46** are patentable for at least the same reasons.

Conclusion

Applicants therefore respectfully submit that claims 20-46 are now in condition for allowance, and earnestly request that the Examiner issue a Notice of Allowance.

Should the Examiner have any questions regarding the present case, the Examiner should not hesitate in contacting the undersigned at the number provided below.

Respectfully submitted,

By 

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